



MOTION PICTURE FILM

TYPE 930 DU PONT RAPID REVERSAL PAN

TYPE 931 DU PONT HIGH SPEED RAPID REVERSAL PAN

Film Data and Processing Recommendations

Type 930 is a medium speed, fine grain, panchromatic reversal film formulated for rapid reversal processing in the same solutions and at the same rate of film throughput as Type 931. Type 931 is a high speed, panchromatic, reversal film designed to give a combination of high picture speed and rapid processing characteristics. When processed as recommended, both products give optimum pictorial and single system sound results for professional television and motion picture production. Highly hardened emulsions characterize both films, making them suitable for ultra-rapid processing at temperatures up to 125°F. without impairment of picture or sound quality. These emulsions are lubricated during manufacture to insure smooth, quiet camera performance even at high humidity or low temperature. Antihalation safety base contributes to the excellent definition of these films. Their exposure and processing characteristics prove ideal for original reversals for immediate use, as in coverage of local interest events for television stations and in coverage of sporting events. Additional prints can be obtained from original reversals on either film by following conventional reversal duplicating or negative-positive duplicating procedures. While these films were designed especially for processing by reversal, they can also be used as negatives.

EXPOSURE DATA:

FILM SPEEDS: Based upon recommended processing and the use of an exposure meter calibrated in accordance with ASA Standard PH2.12-1961.

FOR PROCESSING BY REVERSAL

TYPE	DAYLIGHT	INCANDESCENT
930	64	50
931	160	125

FOR PROCESSING AS NEGATIVE

DAYLIGHT	INCANDESCENT
32	25
80	64

NOTE: By extending reversal first development time, Type 931 can be used at speeds up to 600 Daylight with some sacrifice of picture quality (increased grain and lower maximum density). Trials should be run to determine exact development times. See section on Rapid Reversal.

INCIDENT LIGHT TABLE: Based on incandescent illumination, 1/50 second exposure (24 frames per second, 175° shutter), recommended reversal processing. When this film is processed as a negative material, exposure should be increased approximately 1 stop.

NUMBER OF FOOTCANDLES INCIDENT LIGHT REQUIRED:

LENS APERTURE	f:1.4	f:2.0	f:2.8	f:4.0	f:5.6	f:8.0
Type 930	50	100	200	400	800	1600
Type 931	20	40	80	160	320	640

COLOR SENSITIVITY: Panchromatic



This spectrogram illustrates the response of Types 930 and 931 to light of approximately equal energy over the visible spectrum.

DAYLIGHT FILTER FACTORS

TYPE 930

FILTER	FILTER FACTOR	f STOP INCREASE
3 (Aero-1)	1.5	0.5
Aero-2	2.0	1
6 (K1)	2.0	1
8 (K2)	2.0	1
11 (X1)	4.0	2
12	2.0	1
13 (X2)	6.0	2.5
15 (G)	3.0	1.5
21	3.0	1.5
23A	6.0	2.5
25 (A)	8.0	3.0
29 (F)	16	4.0
47 (C5)	6.0	2.5
56	4.0	2.0
58 (B)	8.0	3.0
3N5	6.0	2.5
8N5	8.0	3.0
30 ND	2.0	1.0
60 ND	4.0	2.0
90 ND	8.0	3.0

TYPE 931

FILTER FACTOR	f STOP INCREASE
1.5	0.5
2.0	1
2.0	1
2.0	1
4.0	2
2.0	1
6.0	2.5
3.0	1.5
3.0	1.5
6.0	2.5
11	3.5
32	5.0
6.0	2.5
4.0	2.0
8.0	3.0
6.0	2.5
8.0	3.0
2.0	1.0
4.0	2.0
8.0	3.0

RECOMMENDED PROCESSING DATA:

SAFELIGHT: Total darkness. Wratten series 3, or equivalent, when necessary.

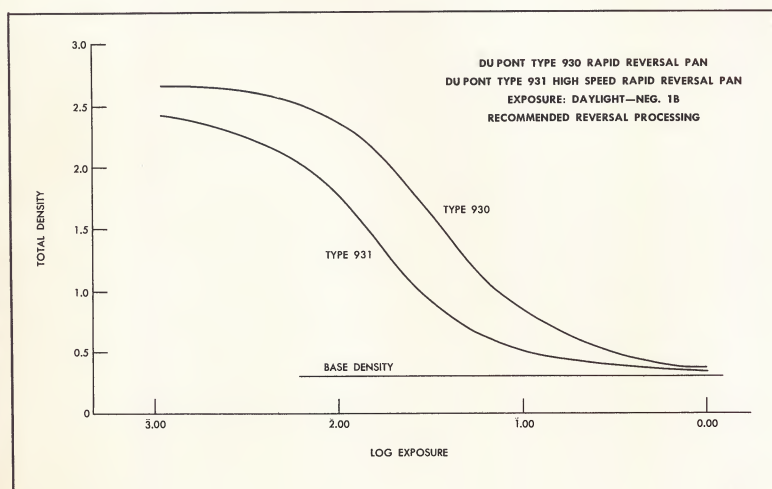
RAPID REVERSAL:

The following data are based on the use of an immersion type processing machine and a temperature of 68°F. for all solutions. Since all processing steps after first development are designed to go either to completion or to a non-critical plateau region, immersion time in the first developer is the most important factor to control in adapting these procedures to a specific machine. For best results, it is recommended that the optimum first developer time be determined for the specific processing machine to be used. This can be done by processing a few correctly exposed films at machine speeds which give immersion times at, above and below the recommended first developer immersion time. Excessive first development results in low shadow density, excessive grain and loss of detail. Insufficient first development results in a dark picture having excessive highlight and shadow densities. The times given for other steps are greater than minimum and less than maximum and represent times available in the average commercial machine.

Because intermittent use of these machines is quite common, the process is based on batch replenishment of processing solutions. Continuous replenishment techniques normally require consideration of a number of factors including processing load, the types of films used, and the intermittency of processing. Tanks should always be scrubbed thoroughly when solutions are changed.

It is recommended that air squeegees be installed on the exit strand from each tank. The addition of the squeegees increases solution life by reducing solution carry-over. It also improves picture quality and helps avoid processing streaks by providing more uniform processing.

Addition of a wetting agent to the first developer is recommended if development streaks are encountered. These may be caused by water contaminants or machine deficiencies. A 0.1% solution of Du Pont Photo-Wet A should be added to the first developer in the amount of 5 fluid ounces per gallon (40 ml. per liter).



OPERATION	IMMERSION TIME AT 68°F.	SOLUTION	SEE NOTES
First development	1 min. 50 seconds	107-D	1, 2, 3
Rinse	30 seconds	Tap Water	4
Bleach	50 seconds	3-B	5
Rinse	30 seconds	Tap Water	4
Clear	30 seconds	3-C	6
Rinse	30 seconds	Tap Water	4
Re-exposure	(Sufficient to expose all residual silver halides)		
Second development	50 seconds	129-D	7
Rinse	30 seconds	Tap Water	4
Fix	50 seconds	22-F	8
Wash	50 seconds	Tap Water	9
Dry	as required		10

NOTES:

1. Adequate recirculation and agitation of the first developer are very important.

2. Additional first developer should be added every 1500 to 2000 ft. of 16mm. film to maintain level.

3. Life of the first developer is about 800 ft. of 16mm. film per gallon of tank capacity when solution level is maintained as recommended above. Long times of standing between periods of use will reduce this useful life.

4. All rinses should be kept fresh. Spray or running water is ideal, and temperatures between 63° and 73°F. are satisfactory. If stagnant rinse is used it should be replaced at least after every 2,000 feet of 16mm. film.

5. Vigorous air agitation of bleach is essential for quality results and considerably lengthens the useful life of the solution. Useful life (with agitation) is about 600 feet of 16mm. film per gallon.

6. Agitation of the clearing bath is not absolutely required but is recommended for optimum quality. Useful life is about 400 ft. of 16mm. film per gallon.

7. Recirculation of the second developer is recommended. Useful life is about 1600 ft. 16mm. film per gallon.

8. Du Pont Concentrated Liquid X-Ray Fixer is also recommended. Useful life is about 1600 ft. 16mm. film per gallon, with the limit being set by failure to properly harden rather than failure to fix.

9. Subject to equipment design but wash should not be less than 50 seconds. Spray wash at 68°F. is recommended.

10. Drying rate should be adjusted so film is dry about $\frac{2}{3}$ of the way through the drying chamber—usually 1 to 3 minutes. Excessive drying may cause curl and brittleness and should be avoided.

HIGH TEMPERATURE PROCESSING:

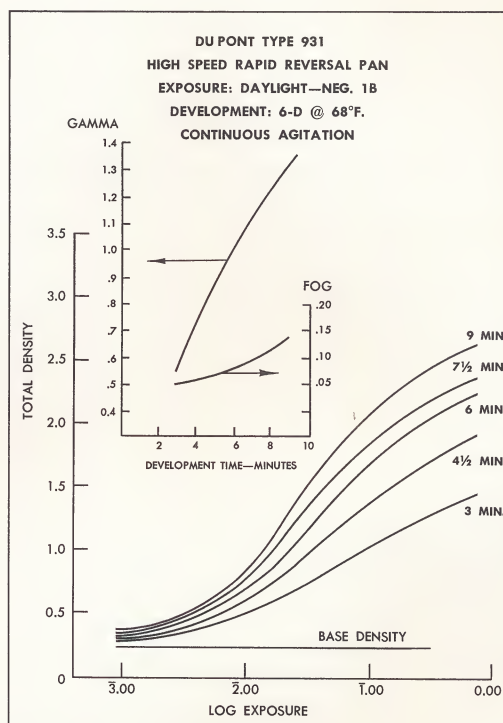
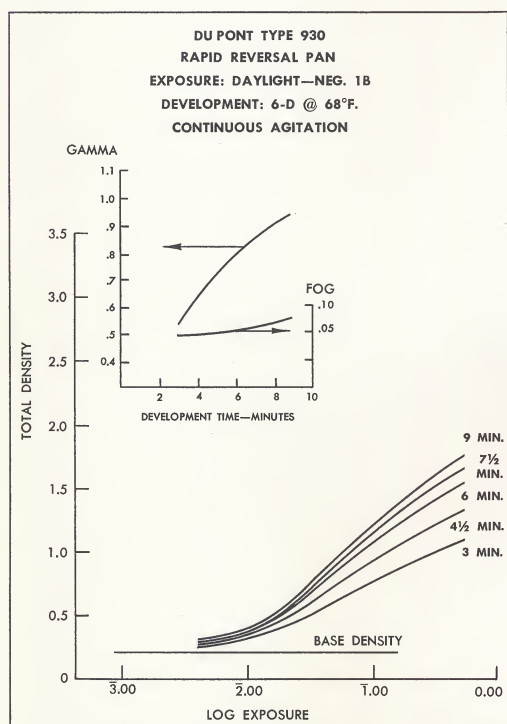
Both Types 930 and 931 have highly hardened emulsions and may be processed at solution temperatures up to 125°F. without impairment of quality by either reversal or negative processing. All solutions, rinses, and wash water should be maintained at approximately the same elevated temperatures. Reduction of process times is necessary, however, to control the picture quality. A useful rule is to cut developing time in half for each 15°F. rise in temperature. Trials should be run to determine optimum development time for individual processing machines.

To minimize the possibility of reticulation when processing at elevated temperatures, it is recommended that sodium sulfate be added to the developers at the rate of 50 grams per liter (6.7 oz. avdp. per gallon). This addition does not affect processing rate but reduces softening of the emulsion.

NEGATIVE DEVELOPMENT:

Recommended gamma: 0.70 ± 0.05

Developing Time: 4 to 5 minutes in 6-D at 68°F. See Rate of Development curves.



FORMULAS

DEVELOPERS

MIX IN ORDER LISTED	6-D		107-D		129-D	
	METRIC	AVOIRDUPOIS	METRIC	AVOIRDUPOIS	METRIC	AVOIRDUPOIS
Water	750 ml.	96 fl. oz.	750 ml.	96 fl. oz.	750 ml.	96 fl. oz.
Calgon**	—	—	0.5 grams	29 grains	0.5 grams	29 grains
Metol	2.0 grams	117 grains	0.6 grams	35 grains	1.0 grams	58 grains
Sodium Sulfite (anhyd.)	98.0 grams	13.1 oz.	50.0 grams	6.7 oz.	50.0 grams	6.7 oz.
Hydroquinone	5.0 grams	290 grains	20.0 grams	2.0 oz. 290 grains	20.0 grams	2.0 oz. or 290 grains
Borax	2.0 grams	117 grains	—	—	—	—
Potassium Bromide	—	—	4.0 grams	230 grains	2.5 grams	145 grains
Potassium Thiocyanate or Sodium Thiocyanate	—	—	5.0 grams 4.2 grams	290 grains or 244 grains	—	—
Sodium Hydroxide	—	—	20.0 grams	2.0 oz. 290 grains	15.0 grams	2.0 oz.
Water to make	1.0 liter	1 gallon (U.S.)	1.0 liter	1 gallon (U.S.)	1.0 liter	1 gallon (U.S.)
Sodium Sulfate*	50.0 grams	6.7 oz.	50.0 grams	6.7 oz.	50.0 grams	6.7 oz.

*Add for high temperature processing.

**Water softener. Use when required.

FORMULAS

3-B BLEACH

MIX IN ORDER LISTED	METRIC	AVOIRDUPOIS
Potassium Dichromate	9.6 grams	1.3 oz.
Sulfuric Acid (concentrated)	10.7 ml.	1.4 fl. oz.
Water to make	1.0 liter	1.0 gallon (U.S.)

3C CLEARING BATH

MIX IN ORDER LISTED	METRIC	AVOIRDUPOIS
Sodium Sulfite (anhyd.)	71.4 grams	9.5 oz.
Water to make	1.0 liter	1.0 gallon (U.S.)

22-F FIXER

MIX IN ORDER LISTED	METRIC	AVOIRDUPOIS
Water	700 ml.	96 fl. oz.
Ammonium Thiosulfate (crystal) or Ammonium Thiosulfate (60%)	139.0 grams or 233 grams	1 lb. 2½ oz. or 1 lb. 15 oz.
Sodium Sulfite (anhyd.)	13 grams	1.7 oz.
Sodium Metabisulfite	1 gram	58 grains
Borax	20 grams	2.0 oz. 290 grains
Acetic Acid (glacial)	20 ml.	2.5 fl. oz.
Aluminum Chloride (6 H ₂ O)	10.6 grams	1.4 oz.
Water to make	1.0 liter	1.0 gallon (U.S.)

DAYLIGHT LOAD—CAMERA SPOOL

FILM WIDTH	PERFORATIONS		TYPE 930			TYPE 931		
			ROLL LENGTHS			ROLL LENGTHS		
	TYPE	ASA	100'	200'	400'	100'	200'	400'
16MM	1R-2994	PH22.109	X	X	X	X	X	X
	1R-2994 (Mag. St.)	—	X	X		X	X	X
	2R-2994	PH22.110	X	X	X	X	X	X
	2R-3000 (FX)	PH22.5				X	X	X
	2R-1500 (8MM)	PH22.17	X			X		
35MM	BH-1866	PH22.93				X		
	KS-1870 (FX)	PH22.36				X		

LABORATORY PACKED

FILM WIDTH	PERFORATIONS		TYPE 930			TYPE 931			
			ROLL LENGTHS			ROLL LENGTHS			
	TYPE	ASA	400'	600'	1200'	400'	600'	1000'	1200'
16MM	1R-2994	PH22.109	X	X	X	X	X		X
	1R-2994 (Mag. St.)	—	X	X	X	X	X		X
	2R-2994	PH22.110	X		X	X			X
	2R-3000 (FX)	PH22.5				X			X
	2R-1500 (8MM)	PH22.17	X		X	X			X
35MM	BH-1866	PH22.93				X		X	
	KS-1870 (FX)	PH22.36						X	

CORE AND SPOOL TYPES

16MM	100' D/L: No. 44—Wound emulsion in 200' D/L: No. 49—Wound emulsion in 400' D/L: No. 60—Wound emulsion in 400' L/P: No. 32—Wound emulsion in 600' L/P: No. 32—Wound emulsion in 1200' L/P: No. 32—Wound emulsion in
35MM	100' D/L: No. 16—Wound emulsion in 400' L/P: No. 25—Wound emulsion in 1000' L/P: No. 25—Wound emulsion in

WINDING: Emulsion in

IDENTIFICATION CHARACTER:

In latent image stencil

In footage number

TYPE 930	TYPE 931
Y	Z
=	+

E. I. DU PONT DE NEMOURS & CO. (INC.)

PHOTO PRODUCTS DEPARTMENT

WILMINGTON, DELAWARE 19898